atopic dermatitis

Atopic dermatitis (also known as atopic eczema) is a disorder characterized by inflammation of the skin (dermatitis). The condition usually begins in early infancy, and it often disappears before adolescence. However, in some affected individuals the condition continues into adulthood or does not begin until adulthood. Hallmarks of atopic dermatitis include dry, itchy skin and red rashes that can come and go. The rashes can occur on any part of the body, although the pattern tends to be different at different ages. In affected infants, the rashes commonly occur on the face, scalp, hands, and feet. In children, the rashes are usually found in the bend of the elbows and knees and on the front of the neck. In adolescents and adults, the rashes typically occur on the wrists, ankles, and eyelids in addition to the bend of the elbows and knees. Scratching the itchy skin can lead to oozing and crusting of the rashes and thickening and hardening (lichenification) of the skin. The itchiness can be so severe as to disturb sleep and impair a person's quality of life.

The word "atopic" indicates an association with allergies. While atopic dermatitis is not always due to an allergic reaction, it is commonly associated with other allergic disorders: up to 60 percent of people with atopic dermatitis develop asthma or hay fever (allergic rhinitis) later in life, and up to 30 percent have food allergies. Atopic dermatitis is often the beginning of a series of allergic disorders, referred to as the atopic march. Development of these disorders typically follows a pattern, beginning with atopic dermatitis, followed by food allergies, then hay fever, and finally asthma. However, not all individuals with atopic dermatitis will progress through the atopic march, and not all individuals with one allergic disease will develop others.

Individuals with atopic dermatitis have an increased risk of developing other conditions related to inflammation, such as inflammatory bowel disease and rheumatoid arthritis. They are also more likely than individuals of the general public to have a behavioral or psychiatric disorder, such as attention deficit hyperactivity disorder (ADHD) or depression.

Frequency

Atopic dermatitis is a common disorder that affects 10 to 20 percent of children and 5 to 10 percent of adults.

Genetic Changes

The genetics of atopic dermatitis are not completely understood. Studies suggest that several genes can be involved in development of the condition. The strongest association is with the *FLG* gene, which is mutated in 20 to 30 percent of people with

atopic dermatitis compared with 8 to 10 percent of the general population without atopic dermatitis.

The *FLG* gene provides instructions for making a protein called profilaggrin, which is cut (cleaved) to produce multiple copies of the filaggrin protein. Filaggrin is involved in creating the structure of the outermost layer of skin, creating a strong barrier to keep in water and keep out foreign substances, including toxins, bacteria, and substances that can cause allergic reactions (allergens), such as pollen and dust. Further processing of the filaggrin protein produces other molecules that are part of the skin's "natural moisturizing factor," which helps maintain hydration of the outermost layer of skin.

Mutations in the *FLG* gene lead to production of an abnormally short profilaggrin molecule that cannot be cleaved to produce filaggrin proteins. The resulting shortage of filaggrin can impair the barrier function of the skin. In addition, a lack of natural moisturizing factor allows excess water loss through the skin, which can lead to dry skin.

Research shows that impairment of the skin's barrier function contributes to development of allergic disorders. An allergic reaction occurs when the body mistakenly recognizes a harmless substance, such as pollen, as a danger and stimulates an immune response to it. Research suggests that without a properly functioning barrier, allergens are able to get into the body through the skin. For unknown reasons, in susceptible individuals the body reacts as if the allergen is harmful and produces immune proteins called IgE antibodies specific to the allergen. Upon later encounters with the allergen, IgE antibodies recognize it, which stimulates an immune response, causing the symptoms of allergies, such as itchy, watery eyes or breathing difficulty. Although atopic dermatitis is not initially caused by an allergic reaction, flare-ups of the rashes can be triggered by allergens. The impaired barrier function caused by *FLG* gene mutations also contributes to the increased risk of asthma and other allergic disorders in people with atopic dermatitis.

Mutations in many other genes, most of which have not been identified, are likely associated with development of atopic dermatitis. Researchers suspect these genes are involved in the skin's barrier function or in the function of the immune system. However, not everyone with a mutation in *FLG* or another associated gene develops atopic dermatitis; exposure to certain environmental factors also contributes to the development of the disorder. Studies suggest that these exposures trigger epigenetic changes to the DNA. Epigenetic changes modify DNA without changing the DNA sequence. They can affect gene activity and regulate the production of proteins, which may influence the development of allergies in susceptible individuals.

Inheritance Pattern

Allergic disorders tend to run in families; having a parent with atopic dermatitis, asthma, or hay fever raises the chances a person will develop atopic dermatitis. When associated with *FLG* gene mutations, atopic dermatitis follows an autosomal dominant

inheritance pattern, which means one copy of the altered *FLG* gene in each cell is sufficient to increase the risk of the disorder. Individuals with two altered copies of the gene are more likely to develop the disorder and can have more severe signs and symptoms than individuals with a single altered copy. When associated with other genetic factors, the inheritance pattern is unclear.

People with changes in one of the genes associated with atopic dermatitis, including *FLG*, inherit an increased risk of this condition, not the condition itself. Not all people with this condition have a mutation in an associated gene, and not all people with a variation in an associated gene will develop the disorder.

Other Names for This Condition

- atopic eczema

Diagnosis & Management

These resources address the diagnosis or management of atopic dermatitis:

- American Academy of Dermatology: Atopic Dermatitis: Tips for Managing https://www.aad.org/public/diseases/eczema/atopic-dermatitis
- Genetic Testing Registry: Dermatitis, atopic https://www.ncbi.nlm.nih.gov/gtr/conditions/C0011615/
- Genetic Testing Registry: Dermatitis, atopic, 2 https://www.ncbi.nlm.nih.gov/gtr/conditions/C1853965/

These resources from MedlinePlus offer information about the diagnosis and management of various health conditions:

- Diagnostic Tests https://medlineplus.gov/diagnostictests.html
- Drug Therapy https://medlineplus.gov/drugtherapy.html
- Surgery and Rehabilitation https://medlineplus.gov/surgeryandrehabilitation.html
- Genetic Counseling https://medlineplus.gov/geneticcounseling.html
- Palliative Care https://medlineplus.gov/palliativecare.html

Additional Information & Resources

MedlinePlus

- Encyclopedia: Atopic Dermatitis
  https://medlineplus.gov/ency/article/000853.htm
- Health Topic: Allergy
  https://medlineplus.gov/allergy.html
- Health Topic: Eczema
  https://medlineplus.gov/eczema.html

Additional NIH Resources

- National Institute of Arthritis and Musculoskeletal and Skin Diseases
  https://www.niams.nih.gov/Health_Info/Atopic_Dermatitis/atopic_dermatitis_ff.asp

Educational Resources

- American Academy of Allergy Asthma and Immunology: Allergic Reactions
  http://www.aaaai.org/conditions-and-treatments/library/at-a-glance/allergic-reactions
- Asthma and Allergy Foundation of America: Allergens and Allergic Asthma
  http://www.aafa.org/page/allergic-asthma.aspx
- Boston Children's Hospital
  http://www.childrenshospital.org/conditions-and-treatments/conditions/atopic-dermatitis-and-eczema
- Cincinnati Children's Hospital: Eczema
  https://www.cincinnatichildrens.org/health/e/eczema
- Disease InfoSearch: Eczema
  http://www.diseaseinfosearch.org/Eczema/9652
- Johns Hopkins Medicine: Allergies and the Immune System
  http://www.hopkinsmedicine.org/healthlibrary/conditions/allergy_and_asthma/allergies_and_the_immune_system_85,P00039/
- KidsHealth from Nemours: Eczema
  http://kidshealth.org/en/parents/eczema-atopic-dermatitis.html
- MalaCards: atopic dermatitis
  http://www.malacards.org/card/atopic_dermatitis
- Merck Manual Consumer Version
  http://www.merckmanuals.com/home/skin-disorders/itching-and-dermatitis/atopic-dermatitis-eczema

- The University of Chicago Medicine
  http://healthlibrary.uchospitals.edu/Search/85,P00257
- World Allergy Organization: The Allergic March
  http://www.worldallergy.org/professional/allergic_diseases_center/allergic_march/

Patient Support and Advocacy Resources

- Allergy UK: What is an Allergy?
  https://www.allergyuk.org/what-is-an-allergy/what-is-an-allergy
- Asthma and Allergy Foundation of America
  http://www.aafa.org/page/eczema.aspx
- Foundation for Ichthyosis and Related Skin Types (FIRST): Itching
  http://www.firstskinfoundation.org/itching
- Immune Deficiency Foundation: Allergies
  http://primaryimmune.org/about-primary-immunodeficiencies/relevant-info/allergies/
- National Eczema Association
  https://nationaleczema.org/atopic-dermatitis-in-children/recognizing-atopic-dermatitis/

Genetic Testing Registry

- Dermatitis, atopic
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C0011615/
- Dermatitis, atopic, 2
  https://www.ncbi.nlm.nih.gov/gtr/conditions/C1853965/

ClinicalTrials.gov

- ClinicalTrials.gov
  https://clinicaltrials.gov/ct2/results?cond=%22atopic+dermatitis%22

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Dermatitis,+Atopic%5BMAJR%5D%29+AND+%28atopic+dermatitis%5BTI%5D%29+AND+review%5Bpt%5D+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+360+days%22%5Bdp%5D

OMIM

- DERMATITIS, ATOPIC
  http://omim.org/entry/603165
- DERMATITIS, ATOPIC, 2
  http://omim.org/entry/605803

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